

REMARKS

Favorable consideration and allowance are respectfully requested for claims 14, 15, 17, 19, 20, 22, 23, 25, 26, 41 – 44 in view of the foregoing amendments and the following remarks. Rejoinder of the withdrawn claims is respectfully requested, to the extent applicable.

New claims 43 and 44 are provided herewith and are supported, at least, by Figures 4, 7 and 8.

A new power of attorney is submitted herewith appointing the practitioners associated with Customer Number 23911 to handle this case. A newly signed terminal disclaimer is also provided, executed by a practitioner associated with Customer Number 23911.

The rejection of claims 14, 15 and 25 under 35 U.S.C. § 102(e) over Glukhoy (6,783,629) in view of Shan et al. (5,948,168) is respectfully traversed. Since this rejection is based on multiple references, it appears to be an obviousness rejection rather than anticipation.

Claim 14 is amended to incorporate the limitations of previously pending claim 16. Neither of the cited references teach the newly incorporated elements of previously pending claim 16, namely that “at least one antenna is disposed in the process chamber, so as to provide a linear line”. Moreover, there is nothing to provide one of skill in the art any motivation to try and combine the references as proposed. Absent such motivation, a proper showing of obviousness cannot be made. Therefore, reconsideration and withdrawal of this rejection are respectfully requested.

The rejection of claims 16 and 22 under 35 U.S.C. § 103(a) over Glukhoy (6,783,629) in view of Shan et al. (5,948,168) and further in view of Tsuchihashi

et al. (6,109,208) is respectfully traversed. Claim 16 is cancelled and the features thereof incorporated into claim 1, as noted above.

The present invention relates to a plasma processing apparatus for supplying microwaves into a process chamber, wherein the process chamber comprises a top plate and a chamber wall, and the chamber wall has at least one antenna so that the antenna penetrates the chamber wall into the inside of the process chamber. The antenna is disposed in the inside of the process chamber with respect to the top plate and the top plate has a plurality of holes for passing a gas to be supplied to the process chamber. The antenna is disposed in the process chamber so as to provide a linear line.

Based on this structure, the present invention provides a plasma processing apparatus which can generate high-density plasma with a high efficiency, even for treating an object having a large area (page 19, lines 8-11 of the present specification). Further, in the present invention, the chamber wall has at least one antenna so that the antenna penetrates the chamber wall into the inside of the process chamber, and the top plate has a plurality of holes for passing a gas to be supplied to the process chamber. As a result the structure provides an improvement in the uniformity in the properties of the gas in the process chamber, e.g., the gas composition and concentration. See, (page 13, lines 20-28 of the present specification).

None of the cited references, either alone or in combination, teach or suggest a plasma processing apparatus for supplying microwaves into a process chamber, wherein the process chamber comprises a top plate and a chamber wall; and the chamber wall has at least one antenna so that the antenna penetrates the chamber wall into the inside of the process chamber; and the antenna is disposed in the inside of the process chamber with respect to the top plate and the top plate has a plurality of holes for passing a gas to be supplied to

the process chamber, wherein at least one antenna is disposed in the process chamber, so as to provide a linear line.

Glukhoy (U.S. Patent No. 6,783,629) discloses a plasma treatment apparatus for treating the surface of an object comprising: a sealed housing; at least one MW antenna for propagation of microwave energy; a source of MW energy for connection to the at least one MW antenna; and an oscillation drive means.

Glukhoy relates to an ICP plasma apparatus using RF power, and the coil used in this reference is k shaped. On the other hand, the present invention relates to a plasma processing apparatus using a linear antenna and microwave power. Accordingly, the present invention is significantly different from Glukhoy.

Shan (U.S. Patent No, 5,948,168) discloses a plasma reactor comprising: a vacuum chamber and a wafer supporter for holding a semiconductor wafer in the chamber; a reactant gas source for furnishing at least a reactant gas; plural gas flow channels extending from the reactant gas source and into the chamber, the reactant gas source establishing gas flow rates in respective gas flow channels whereby the reactant gas flows through each of the channels toward the chamber each of the plural tubes having an intermediate portion lying between the reactant gas source and the chamber.

This reference uses so-called “remote plasma”, wherein a gas is converted into plasma while moving a gas into an upper plate disposed on a chamber, and the thus the generated plasma is flowed down into the chamber, to thereby transport radical species only. In Shan, ions are deactivated in the transportation thereof, on the basis of the collision with the side wall of the transporting pipe. This is significantly different from the presently contemplated invention.

Tsuchihashi (U.S. Patent No. 6,109,208) discloses a plasma generating apparatus for generating plasma comprising: a vacuum vessel; a discharge gas supplying means; a microwave emitting means; a microwave introducing means; and magnetic field generating means; wherein the microwave introducing means includes a plurality of tube-shaped or rod-shaped dielectric members arranged in parallel and inserted into the vacuum vessel.

In this reference, the microwave antenna is surrounded by a dielectric material from the upper plate into the chamber. This structure of Tsuchihashi is significantly different from that of the present invention which uses a liner antenna in combination with microwave.

Thus, none of the references in the proposed combination recite a structure as is presently claimed with a microwave-based apparatus and a linear antenna. Given their significant differences, one of skill in the art would not, in fact, be inclined to try to combine the references. Moreover, there is nothing to provide one of skill in the art any motivation to try to combine the cited references.

As set forth in § 706.02(j) of the Manual of Patent Examining Procedure (MPEP), Patent and Trademark Office, U.S. Department of Commerce, (8th ed. Rev. 3, August, 2005), for a proper obviousness rejection:

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

Because there is no suggestion or motivation that would cause one of skill in the art to try to combine the references as proposed, and because, even assuming one were to try to combine the reference, the resulting combination would still not

meet each and every claim limitation, the Office Action has not made out a *prima facie* showing of obviousness.

Further, the unpredicted and unexpected results achieved by the presently claimed invention, as described above, are such that even if the references are read to provide the basis for an obviousness rejection, that showing of obviousness is overcome by the expected results achieved with the claimed invention. Accordingly, reconsideration and withdrawal of this rejection are respectfully requested.

The rejection of claim 17 under 35 U.S.C. § 103(a) over Glukhoy (6,783,629) in view of Shan et al. (5,948,168) and further in view of Wartski et al. (5,637,150) is respectfully traversed.

Claim 14 is amended to incorporate the limitations of previously pending claim 16. Claim 17 ultimately depends from claim 14. None of the cited references teach that an antenna is disposed in the process chamber so as to provide a linear line. Accordingly, the proposed combination of references fails to teach or suggest each and every claim limitation. Moreover, there is nothing to provide one of skill in the art any motivation to try and combine the references as proposed. Absent such motivation, a proper showing of obviousness cannot be made. Therefore, reconsideration and withdrawal of this rejection are respectfully requested.

The rejection of claims 19, 20 and 22 under 35 U.S.C. § 103(a) over Glukhoy (6,783,629) in view of Shan et al. (5,948,168) and further in view of Minaee et al. (6,558,635) is respectfully traversed.

As noted above, claim 14 includes the limitations of previously pending claim 16. Claims 19, 20 and 22 ultimately depend from claim 14. None of the cited references teach that an antenna is disposed in the process chamber so as

to provide a linear line. Accordingly, the proposed combination of references fails to teach or suggest each and every claim limitation. Moreover, there is nothing to provide one of skill in the art any motivation to try and combine the references as proposed. Absent such motivation, a proper showing of obviousness cannot be made. Therefore, reconsideration and withdrawal of this rejection are respectfully requested.

The rejection of claim 23 under 35 U.S.C. § 103(a) over Glukhoy (6,783,629) in view of Shan et al. (5,948,168) and further in view of Tonotani et al. (6,181,069) is respectfully traversed.

As noted above, claim 14 includes the limitations of previously pending claim 16. Claims 23 depends from claim 14. None of the cited references teach that an antenna is disposed in the process chamber so as to provide a linear line. Accordingly, the proposed combination of references fails to teach or suggest each and every claim limitation. Moreover, there is nothing to provide one of skill in the art any motivation to try and combine the references as proposed. Absent such motivation, a proper showing of obviousness cannot be made. Therefore, reconsideration and withdrawal of this rejection are respectfully requested.

CONCLUSION

In view of the foregoing, the application is respectfully submitted to be in condition for allowance, and prompt favorable action thereon is earnestly solicited.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket No. 101249.52600US).

Respectfully submitted,

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